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ARCHES NATIONAL PARK

MONITORING PROJECTS 2004

1. VEGETATION MONITORING

- There are 20 long-term vegetation-monitoring plots located throughout Arches NP.
- All vegetation data from 1989-2004 has been organized, standardized, summarized, and stored in one huge MS ACCESS file.
- Objectives are to track long-term vegetation change and natural variation in the major vegetation types throughout all the parks of the SEUG.
- Digital temperature and precipitation stations were installed in most plots in 2004. These will be used to correlate trends and natural variation with local weather conditions.
- The latest report (2002) is a compilation and integration of all past data. A 2004 report will be released in 2005.

Schelz, Charles and Moran, Mary. 2002. **Vegetation long-term monitoring at Arches National Park, 1987-2002**. USDI, National Park Service, Southeast Utah Group. Moab, UT. 154 pages.

Abstract: Long-term monitoring of vegetation at Arches National Park (ARCH) started in 1987 and has evolved steadily through 2002. The objectives of the Long-term Vegetation Monitoring Program at Arches NP are:

- Provide standardized procedures and data elements for describing, classifying, and comparing specific habitat types.
- Provide an integrated and organized database of ecological information to facilitate good habitat analysis.
- Provide data interchange with other Federal agencies, State agencies, and private or academic institutions.
- Provide a resource information base to guide park management on the preservation and protection of park resources.
- Predict and analyze impacts of land development on resources in and around the parks.
- Monitor condition and trend of the various vegetation habitats that occur in Arches National Park.

Twenty permanent vegetation plots have been established throughout Arches National Park. Some of these have only been monitored for a couple of years, but the majority have been monitored during the spring every year for at least 10 years.

In 2002, we were able to collect soil samples at each transect and provide physical and chemical soil properties at each site. Our plant association names have also been changed to reflect the latest national standard. We added soil crust index ratings for every quadrat in each transect. We also added an environmental description of each of the transects, and UTM coordinates and maps showing the exact location of each transect.

Trends: We did a statistical analysis of the past 12 years of data on eight of the transects and found all the vegetation communities are changing, some slower than others. Our analysis indicates the Pinyon-Juniper woodland community is changing the most rapidly. The analysis also shows a high stochastic variation of species composition in many of the vegetation communities.

No influx of exotic species has been noted in any of the plots. Cheatgrass (*Bromus tectorum*) is in every plot and the percent cover varies widely from year to year depending on the timing of precipitation events during the previous winter or fall. This is also true for many annuals, there is a high year to year variation of species composition and cover which is probably based on recent temperature and precipitation events. The current drought has had a negative effect on recruitment and growth of most perennials, especially trees and shrubs. Of the trees, pinion pine (*Pinus edulus*) is the most susceptible to drought and these are highly stressed and dying. High stress makes trees more susceptible to insect damage. Shrubs are shrinking by letting outer growth die. This is a strategy to preserve energy and water. Perennial grasses are dying.

2. WATER QUALITY MONITORING

- There are seven water quality monitoring sites in Arches NP that are currently being monitored on a monthly basis every three years. All samples are sent to the Utah Department of Health in Salt Lake City for a complete chemical analysis. Results are available on the internet at the Environmental Protection Agency's STORET web site.
- Bacteria samples are taken at all sites for a fecal coliform analysis. Results are compared to state standards and any samples that exceed standards are reported to the park.
- Macro-invertebrates are collected at all sites. These are collected three times a year. Data will eventually be compared to water chemistry results to establish water quality indicators.
- Objectives are to monitor water quality at sites where there is a potential for change due to various land use and recreational impacts.
- A comprehensive report of this program is in production and will be ready in early 2005.

Trends: Water quality at all sites is holding steady. No appreciable changes have been noted. Bacteria counts are consistently high after rain events. Visitors should be warned of this when it has rained in the past week.

3. WATER QUANTITY MONITORING

- Four sites in or near the Arches western boundary are currently being monitored for water quantity discharge on a monthly basis.
- This study was a cooperative effort between the Utah Geological Survey (UGS) and the NPS.
- Objectives are to monitor water quantity at sites where there is a potential for change due to various land use and recreational impacts.

Hurlow, Hugh A., and Charles E. Bishop. 2002. **Recharge areas and geologic controls for the Courthouse-Sevenmile spring system, Western Arches National Park, Grand County, Utah.** Special Study 108, Utah Geological Survey, Utah Division of Natural Resources.

Abstract: SEUG Resource Management Division personnel have collected monthly discharge data from two springs in Sevenmile Canyon and two springs in Courthouse Wash from 2002 to the present. The UGS used the discharge data to construct a water budget model for the study area. Using the results of the water

budget model, spring water chemistry, and knowledge of the local geology the study concluded that the source of water for existing domestic wells outside of the park and springs in the park was the same aquifer (Moab Member aquifer). The study results will be used to formulate a ground water protection zone on the west side of the park that grandfather some existing uses and regulates future uses.

Trends: Since we started this project in 2002 there has been a steady decrease in quantity of water at all sites. This has been attributed primarily to the drought and not to increased water draw from nearby wells. However, the water draw from a new well, established in 2001, at the Dalton Wells area is a concern. The water is used for a newly developed alfalfa field.

4. RIPARIAN MONITORING

- A total of 5 permanent long-term riparian monitoring plots have been established in ARCH since 1998. Four of these are in Lost Spring Canyon and the other in Courthouse Wash.
- Plots include a vegetation transect, stream cross-section survey, and extensive photo-points.
- All photo-points have been re-photographed in 2004.
- Objectives are the long-term monitoring of recovery trends of the riparian zones in ARCH.
- Results of Lost Spring Canyon plots were reported in the 2002 Lost Spring Monitoring report. An updated report is will be released in late 2004.

Trends: See Lost Spring Canyon section (#5)

5. LOST SPRING CANYON MONITORING AT ARCH

- Study is designed to monitor recovery from grazing and other impacts which ended in 1999 after many years.
- Set up upland vegetation plots, photo-points, and riparian plots in Lost Spring Canyon in ARCH between 1999 and 2001. All plots will be re-monitored in 2004.
- Data has been collected for the past 5 years and a new report will be released in early 2005.
- The latest report is a compilation and integration of all past data.

Scholz, Charles. 2002. **Long-term monitoring of habitat recovery in Lost Spring Canyon, Arches National Park, 1999-2002.** USDI, National Park Service, Southeast Utah Group, Resource Management Division. Moab, UT. 84 pages.

Abstract: A monitoring program was established in Lost Spring Canyon of Arches National Park in 1999. The main objective is to gather baseline data on condition and trends of various vegetation communities and soil crust conditions in the Lost Spring Canyon area, and develop a long-term monitoring program that will document recovery of the soils and vegetation from grazing.

- 1) Establish permanent long-term soil crust and vegetation monitoring transects in the Lost Spring Canyon area in various plant communities.
- 2) Document plant species diversity and percent cover in the established long-term monitoring plots.
- 3) Rate the age of the cryptobiotic soil and its developmental stage using a scale developed by Belnap for visitor impact studies at Arches National Park (1995).
- 4) Photograph permanently marked quadrats in the vegetation and cryptobiotic transects. Establish permanent photo points around each transect and throughout the canyon.

- 5) Establish a permanent riparian bird transect to monitor changes in avian species diversity.

Trends: The riparian area in Lost Spring Canyon is slowly recovering. This is evidenced primarily by an increase in willow (*Salix* spp.) and rushes (*Juncus arcticus*) in the upper section of the canyon. The drought has retarded recovery in all sections but especially in the lower areas. No cows or vehicles have been in the canyon for at least three years. This has allowed the stream channel and roadways to begin the process of recovery. A motorcycle or two forced their way into the upper canyon in the spring of 2004 and caused extensive soil damage throughout the area. Adjacent lands, especially just north of the boundary have experienced increased visitation and off road impacts. It is still too early to remark on upland vegetation recovery because the plots are only 3-4 years old and the drought has had a severe effect. The combination of a long history of intense grazing impacts and the current drought have left the upland in poor shape but slightly improving.

6. VISITOR EXPERIENCE AND RESOURCE PROTECTION MONITORING

- VERP fieldwork was postponed due to lack of funding, concerns about established protocols and I&M priorities.
- Monitoring of cryptobiotic soils, vegetation, and social trails are the top priorities. Photo-points are used in conjunction with standard protocols.
- Objectives are to monitor long-term change of specific visitor high-use areas and to recommend remedial management actions.
- A new protocol using low altitude photography to examine soil crust condition, social trails, and vegetation trends is being investigated by the USGS. Results should be available in 2005.

Schelz, Charles and Whitham, Linda. 1999. **Arches National Park: VERP Report (Visitor Experience and Resource Protection), Biological Resource Monitoring, 1996-1999.** USDI, National Park Service, Southeast Utah Group. Moab, UT. 93 pages.

Abstract: For areas failing standards most of the impacts have the same cause - visitor trampling off-trail. The question is "How do we keep visitors on the trails? This can probably never be completely accomplished, but through a concerted and coordinated effort by everyone impacts can be minimized.

Education is probably the strongest deterrent. Multilingual education of the impacts and their causes will carry the message a lot further. Education must permeate all levels of visitor contact: from the entrance station, to the visitor center, to the interpretive walks, to signs on the trails, to law enforcement, to the overt behavior of all park personnel.

Creating physical barriers is an effective method of keeping people on the trails. This can be accomplished by building fences, laying dead branches in the way, or re-vegetation. All these methods are effective and every area has a particular set of circumstances where one method is superior to the other. The decisions should be site specific and must be done with the utmost of subtlety and respect for the ecological and aesthetic values of that particular area.

Providing areas of rest and shade on the trail will keep many visitors from wandering. This is a desert ecosystem and all animals need shade, especially humans, which tend to be out more during the least comfortable time of the day. This has to be acknowledged by management and an effort should be made to provide areas on the trails where visitors can congregate out of the sun and heat and enjoy the environment around them. These structures should be on the trail and blend into the surrounding landscape so as not to detract from the feeling of being out in nature. For highly visited areas that are far from the trailhead we should consider a restroom. Sanitation impacts have become a problem at some locations.

Many areas have a couple of interesting features that are just too tempting for visitors. It could be an arch, an alcove, a fin, a large juniper, or a spot with a view. Most of these areas are easily identifiable by the social trails leading to them. It makes sense to render some of these enticing sites accessible by allowing a well defined undeveloped trail that will funnel most of the people to the site and reduce incidence of creating multiple dispersed trails. Every area that is out of standard should be analyzed for determining locations of undeveloped trails that will keep visitor social trailing to a minimum.

Trends: No improvement of soil conditions has been noted in many of the areas monitored. This is probably because of the consistent high level of visitation in these areas. Many changes are caused by park management actions, especially the trail building and hardening projects that have commenced in the past seven years.

7. ARCHES BISQUITROOT MONITORING

- A new permanent long-term monitoring program for the Arches biscuitroot has been established in the major populations in Arches National Park.
- Areas monitored include high and low visitor impact zones to help determine causes of population trends.
- A 2004 report will be released in 2005 and will document protocol adjustments and findings of this two year study. This program is designed so that monitoring can occur every 3-5 years in the future.

Scholz, Charles, and Mary Moran. 2003. **Arches Biscuitroot (*Lomatium latilobum*) Monitoring Program, Arches National Park, 2003.** U.S. Department of Interior, National Park Service, Southeast Utah Group, Resource Management Division. Moab, UT. 48 pages

Abstract: *Lomatium latilobum* (Rydb.) Mathias (Welsh et al., 1993) or the “Arches biscuitroot”, in the Umbelliferae family, is a rare perennial endemic plant found primarily in Arches National Park and the surrounding area. The Arches biscuitroot is currently ranked a G1/S1 (critically imperiled globally because of extreme rarity, critically imperiled in the state because of extreme rarity) by the Colorado and Utah Natural Heritage Programs. It has recently been placed under review to become a candidate for Federal listing as either Threatened or Endangered.

This is a report of the first year (2003) of a two-year project to develop a long-term monitoring program for the Arches biscuitroot. All existing data on the Arches biscuitroot was collected and examined for incorporation into the present program. It was determined that the historic data collection on population dynamics will be maintained at its current level under the direction of Dr. Lisa Floyd-Hanna of Prescott College, Arizona, and that basic monitoring will be improved and expanded to represent a greater portion of the existing populations in Arches National Park.

A new methodology has been employed that incorporates taking a photo of every plant in representative areas of each major sub-population of the Arches biscuitroot.

Trends: No trends are evident because this is the first year of this project. There appears to be many more plants than originally estimated by Floyd-Hanna in 2000. However, no new populations have been discovered.

8. RIPARIAN BIRD MONITORING

- Avian point count surveys were performed at three survey sites for the eleventh year in a row in 2004.

- Data on vegetation composition and structure at each monitoring point was collected in 2002. This data will be correlated with any apparent trends.
- The 2004 report “Avian Population Monitoring in Riparian Habitats within National Parks of the Southeast Utah Group” is complete. Copies will be sent to the various parks and to the Utah State Fish and Wildlife Department.
- Objective is to track long-term trends and natural variation of avian populations in riparian areas of ARCH.

Daw, Sonya D. 2004. **Avian population monitoring in riparian habitats within the Southeast Utah Group of the National Park Service, 1992-2004.** NPS Report on file in Biologist's office, Southeast Utah Group, 2282 SW Resource Blvd, Moab, Utah. 48 pp.

Abstract: 2004 is the twelfth continuous year of avian point count surveys during the breeding season in riparian habitats of the Southeast Utah Group of the National Park Service. Surveys were designed to contrast areas of high and low visitor use, and to monitor trends in abundance and species richness for breeding Neotropical migratory birds.

Trends: Eight transect areas, each with 10 point count survey stations, and divided among Arches and Canyonlands National Parks, and Natural Bridges National Monument, were visited 3 times in May and June, 2004, for a total of 240 stations surveyed.

Neotropical migrant bird species represented 51 (82%) of the 62 total species detected. Species richness was highest in the Lost Spring Canyon transect of Arches National Park, and lowest in the Upper Lower Courthouse Wash transect of Arches National Park. Relative abundance was highest in Lost Canyon and Salt Creek in Canyonlands National Park, reflecting a pattern which has held for 5 of the past 6 years. Relative abundance was lowest in Upper Lower Courthouse Wash. Unusual species observed this year include the blue-winged warbler, Lewis's woodpecker, Lincoln's sparrow, olive-sided flycatcher, and the rufous hummingbird.

Based on the Utah Partners in Flight Avian Conservation Strategy's list of primary breeding habitats, a large number of "non-riparian" bird species are detected by this survey, some with enough regularity to potentially serve as an index of abundance for species using other habitats. Several of these species also were observed to nest in riparian vegetation, taking advantage of the riparian/upland ecotone.

I recommend including the early May survey periodically to monitor transient Neotropical migrant species, changing our database format to Microsoft Access, conducting more in-depth statistical analyses of the data in the context of the statewide riparian survey with which this project was designed to be compatible, re-assessing transect length based on power needs and a full analysis of bird detection as a function of time of day, and re-assessing survey objectives to include demographic parameters.

9. HISTORIC PHOTO PROJECT

- Objectives are to access and archive as many historic photos as possible of Arches National Park and to use a subset of these to establish long-term monitoring photo-points for ecosystem trend and visitor impact analysis.
- Project is divided into three components:
 - 1) Extensive worldwide search and collection of historic photos of areas within Arches National Park. Search includes local families, local historic societies, various local and nationwide historic photo collections, and various government repositories. This component also involves the digital scanning and storage of all photos and the development of a photo database.

- 2) Selection of specific photos or sets of photos for long-term ecological trend monitoring. Locating and documenting exact locations of each photo.
 - 3) Producing a report on the project with all aspects documented and analysis and discussion of evident trends. Management recommendations will be included.
- At this point we are nearly finished with the first phase, although it will probably never be finished. Historic photos of Arches National Park have been collected from various individuals, regional museums, universities, and depositories. All photos have been scanned into digital format and entered into a photo database.
 - This project has contracted an historian to assist in the search for photos and the production of the final report..

Trends: No trends apparent at this early stage of the project. Intense livestock grazing in the late 19th and early 20th century have had a pronounced and severe negative impact on areas of Arches National Park.

10. NIGHT SKY MONITORING

- Night Sky monitoring began in 2002 with baseline data acquisition finished in 2004.
- Objectives are to establish baseline levels for future comparison.

Schelz, Charles, and Angie Richman. 2003. **Night Sky Monitoring Program, Southeast Utah Group, 2001-2003.** U. S. Department of Interior, National Park Service, Southeast Utah Group, Resource Management Division. Moab, UT. 74 pages.

Abstract: This report lays the foundation for a Night Sky Monitoring Program in all the park units of the Southeast Utah Group (SEUG). Long-term monitoring of night sky light levels at the units of the SEUG of the National Park Service (NPS) was initiated in 2001 and has evolved steadily through 2003. The Resource Management Division of the Southeast Utah Group (SEUG) performs all night sky monitoring and is based at NPS headquarters in Moab, Utah. All protocols are established in conjunction with the NPS National Night Sky Monitoring Team.

This SEUG Night Sky Monitoring Program report contains a detailed description of the methodology and results of night sky monitoring at the four park units of the SEUG. This report also proposes a three pronged resource protection approach to night sky light pollution issues in the SEUG and the surrounding region. **Phase 1** is the establishment of methodologies and permanent night sky monitoring locations in each unit of the SEUG. **Phase 2** will be a Light Pollution Management Plan for the park units of the SEUG. It will assess current conditions in the park units of the SEUG and present solutions for areas where light pollution can be minimized. It will also list lighting design considerations that management can use in future development. **Phase 3** will be the development of educational outreach materials for local park interpreters and non-NPS groups. The materials will present the importance of the night sky and the issues that threaten its integrity. They will also present the known and postulated social and natural resource ramifications of light pollution on a local, national, and worldwide scale. It is intended that these three phases will be developed concurrently.

PHASE 1:	SEUG Night Sky Monitoring Program
PHASE 2:	SEUG Night Sky Light Pollution Management Plan
PHASE 3:	Night Sky Educational Material Packet

The objectives of the Long-Term Night Sky Monitoring Program at NPS units of the Southeast Utah Group are:

- Develop protocols and gather baseline data on night sky light pollution levels at the four units of the Southeast Utah Group.
- Monitor condition and trend of night sky light pollution in the park units of the Southeast Utah Group.
- Provide a resource information base to guide park management in the preservation and protection of our night sky resources.
- Establish standardized procedures and data elements for describing, classifying, and comparing regional light pollution in the night sky.
- Present an integrated and organized database of night sky information to facilitate present and future analyses and evaluations.
- Predict and analyze impacts of surrounding communities and land development on night sky resources within and in the region surrounding our park units.
- Encourage night sky data interchange with other federal agencies, state agencies, and private or academic institutions.
- Provide data for the verification of existing light pollution models.

We have established our monitoring methodology in tune with the national protocols of the NPS Night Sky Monitoring Team. Permanent night sky monitoring locations have been selected at each of the four park units of the Southeast Utah Group. We have approximately 80 percent of a complete baseline data set from each of these stations.

Trends: Arches National Park, Balanced Rock Area. This site is generally quite dark, except for the glow coming from the town of Moab, Utah, 10 miles to the south and the glow of Grand Junction, Colorado, 75 miles to the east. Unfortunately, the glow from Moab washes out the Scorpius Milky Way and extends 15 degrees altitude and encompassing roughly 15 degrees of azimuth. Despite the large impact from these two major light sources, the sky above Arches is typically amongst the darkest in the country. No trends have been detected because this project has just been established. We can say with confidence however, that as nearby towns grow and become more developed, and don't have proper lighting design guidelines, the quality of the night sky has and will degrade.

11. FIRE EFFECTS MONITORING

- Four fire effects monitoring plots in Arches NP have been monitored for the past five years, following a 1999 fire in Salt Valley. All data and photos have been sent to the regional office.
- Objective is to track long-term recovery of this grassland ecosystem after fire disturbance.

Trends: There is evidence of an upward trend in recover but the current drought has made this process extremely slow.

12) WEATHER MONITORING

- Weather data has been collected by Arches NP staff since 1990 and sent to headquarters for inclusion in a data base. This will be used to correlate measured trends with weather conditions.

SPECIES LISTS

Schelz, Charles, and Mary Moran. 2000-2004. **Reptiles of Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. 2 pages.

Schelz, Charles, and Mary Moran. 2000-2004. **Plant List for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. 2 pages.

Schelz, Charles, and Mary Moran. 2000-2004. **Amphibians of Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. National Park Service, Southeast Utah Group. Moab, UT. 2 pages.

Schelz, Charles, and Mary Moran. 2000-2004. **Mammals of Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. Southeast Utah Group, National Park Service. Moab, UT. 3 pages

Schelz, Charles, Ian Torrance, and Steve Budelier. 2000-2004. **List of Exotic Plants for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. 3 pages

Schelz, Charles. 2004. **List of Exotic Animals for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. 3 pages

Schelz, Charles. D., and S. Daw. 1999-2001. **List of birds for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** U. S. Department of Interior, National Park Service, Southeast Utah Group. Moab, UT. 8 p.

Schelz, Charles, and Mary Moran. 2000-2004. **Species list of fish for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments,** National Park Service, Southeast Utah Group. 2 pages.

Schelz, Charles, and Mary Moran. 2000-2004. **List of Threatened, Endangered, and Sensitive Species for Arches and Canyonlands National Parks, and Hovenweep and Natural Bridges National Monuments.** National Park Service, Southeast Utah Group. National Park Service, Southeast Utah Group. Moab, UT. 2 pages.